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Process for the production of massive small spheres, specifically of those comprised of glass.

The invention is concerned with a process for the production of massive small spheres, specifically of those that are comprised of glass, and that are preferably utilized as grinding bodies in fast running ball-mills that are utilized for milling, grinding, dispersing, and homogenization of various suspensions. The goal of the invention is to create a process, with which small glass spheres can be produced effectively and efficiently directly from the molten glass stream, and with which the small glass spheres are hardened during the forming process. According to the invention, a molten glass stream will be introduced in between two rollers that run in opposing directions to each other with their frontal surfaces, and that are equipped with engraved half spheres in their exterior circumferences, and the molten glass flow is pressed into said engraved indentations during the rolling operation of said rollers, and as a result hereof the small glass spheres are thus created that subsequently will be guided into a cooling bath.

Application fields of the invention

The invention is concerned with a process for the production of massive small spheres, specifically of those that are comprised of glass, and that are preferably utilized as grinding bodies in fast running bal-mills that are utilized for milling, grinding, dispersing, and homogenization of various suspensions, however, they also can be utilized as sealing bodies in ink cartridges, for the filling of rectification colonies in the chemical industry, and for many other purposes.

Characteristic of the known technical solutions

A known process for the production of massive small spheres that consist of glass is based on the fact that a molten glass flow drops onto a cold contact surface, which causes the glass flow to shatter into individual droplets.

Herewith, an air stream is directed onto the contact area of said glass flow to support the shattering of the glass flow, and to remove the droplets.

A high percentage of fibers and irregularly shaped droplets is created with this process that results in a relevantly lower quality.

Another known process operates in such a way that one first produces glass that subsequently is cooled off. The cooled off glass, called glass shards, will subsequently be milled and sifted to the dimension of the desired finished small glass sphere. The material that is sifted away will be introduced into a fixture, in which a flame that is moving with a slow speed upward carries the particles with it, and thus ensures that the material forms into spheres during the movement with said flame. The particles that were shaped into spheres are subsequently collected into suitable containers, or similar devices that are located at the upper end of the tower of said fixture.

Only small glass spheres of a certain dimension that is up to a maximum of 0.6 mm can be produced with such a process. A further known process for the production of small glass spheres is based on the process that one drops milled glass particles through an electric arc, in which said particles would melt, and thus shape into spheres.

This process possesses not only all mentioned before disadvantages, but it is also specifically uneconomical because of the fact that the electric heating will only occur during that process step that is utilized for the production of the small spheres themselves.

Another known process operates in such a manner that one allows a molten glass stream to flow into a carrier gas stream that flows with a high speed, and with which said glass flow is mainly across the direction of the molten glass stream, which causes the shattering of the glass.

The carrier gas stream is surrounded by a multiple number of burners that produce burning products that have a temperature that is higher than the melting temperature of glass. Following this process, the shattered glass will be separated from the gas stream and subsequently cooled down and collected.

A part of the disadvantages of such a process is that the zone that is kept above the melting temperature of glass, and in which the shattered glass particles will

be reformed into spheres, is too short, resulting in the fact that an uncommonly high percentage of fibers, elongated particles and other lower quality products of lesser value are created herewith. Furthermore, it is not possible to produce any larger small glass spheres with this kind of process.

A further known process is based on the fact that thread like glass strings are introduced in a rectangular fashion into one side, or both sides of an almost vertically proceeding flame band, and that the small glass spheres that are created herewith are transported across the entire length of the flame field, and are subsequently introduced into a cooling bath.

The disadvantage of this process can be found in its rather mediocre performance.

Further processes for the production of small glass spheres, for example, the utilization of an ultra sound wave field, of a plasma burner, of a metal tape, or the introduction of a vertical blowing flame into a body consisting of molten glass, or similar processes, are also known, but they also possess the shortcomings that are described in detail in the above.

Goal of the invention

The goal of the invention is the creation of a process for the production of small glass spheres, with which the above-mentioned disadvantages will be eliminated. Furthermore, the invention is concerned with a process for the production of small glass spheres; with which said small glass spheres can be shaped immediately from a molten glass stream.

Small glass spheres shall be produced effectively and economically with the process following the invention, and it shall be possible herewith, to harden said small glass spheres during the forming process.

Characteristics of the invention

According to the invention, the scope will be solved by means of the process, in which a molten glass stream is guided into two rollers that rotate in opposition to each other, and are in contact with each other at their frontal surfaces, and that are equipped with the desired engraved half spheres at their exterior surfaces. Herewith, the molten glass stream will be pressed into the engraved indentations during the rolling process, and the small glass spheres are thus created. Subsequently, said small glass spheres which are produced will be introduced into a cooling bath.

The process that is executed according tothe invention possesses tremendous advantages if compared with the known processes. Said advantages reach their zenith in the fact that small glass spheres that possess an outstanding quality,

and that can be produced in a variety of dimensions between 2 and 10 mm can be produced herewith in a very economical manner.

Execution examples

In the following, the process that is executed according to the invention will be explained in more detail with the support of an execution example. The drawing that belongs to this displays the schematic arrangement of the process for the production of small glass spheres.

The installation that is constructed according to the invention consists of a melting furnace 1, in which the goods to be molten, for example, glass rods 2, will be molten down. The molten material exits the furnace through an opening that is located at the bottom side of the melting furnace 1 in the form of a molten glass stream 3. Herewith, the opening of the melting furnace 1 is calibrated in correlation with the desired amount of glass, as well as in correlation with the diameter of the small glass spheres 6. Furthermore, it is possible herewith that the molten glass stream 3 can be controlled exactly by means of varying the temperature in the melting furnace 1, as well as varying the temperature at the exit die of said furnace.

The molten glass stream reaches the two cooled rollers 4 and 5, which are rotating in opposing directions, and that have each of the halves of the desired glass sphere diameters engraved in their exterior circumferences. Subsequent to the shaping process, the small glass spheres drop into the cooling bath 7 immediately after the shaping process.

Patent claim

1. A process for the production of massive small spheres, specifically those that consist of glass, characterized in such a way that a molten glass stream will be introduced in between two rollers that run in opposing directions to each other with their frontal surfaces, and that are equipped with engraved half spheres in their exterior circumferences, and the molten glass flow is pressed into said engraved indentations during the rolling operation of said rollers, and as a result hereof the small glass spheres are thus created that subsequently will be guided into a cooling bath.

Herewith 1 page of drawings

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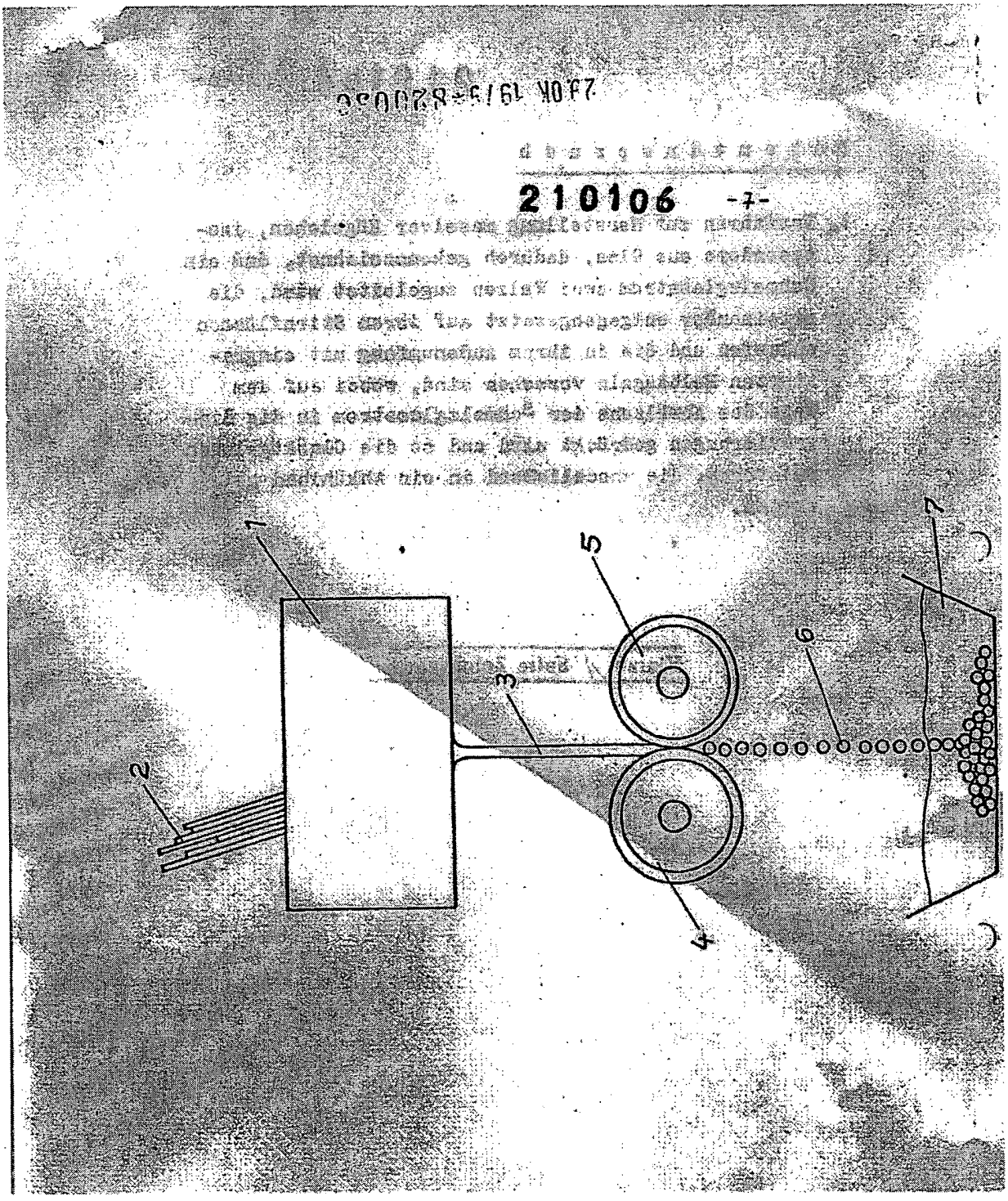
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